The inversion of (3) was so chosen that the original sphere became a plane, thus making the solution depend upon the simpler problem of finding the orthogonal trajectory of a family of plane curves.

Also solved by G. B. M. Zerr.

CALCULUS.

81. Proposed by J. OWEN MAHONEY, M. Sc., Dallas, Texas.

Solve, $y^2\dfrac{d^2y}{dx^2}+a\dfrac{dy}{dx}=bx.$

Solution by G. B. M. ZERR, A. M., Ph. D., P^arsons, W. Va.

Let $y=A+Bx+Cx^2+Dx^3+Ex^4+\ldots$

$dy/dx=B+2Cx+3Dx^2+4Ex^3+55Fx^4+\ldots$

$d^2y/dx^2=2C+6Dx+12Ex^2+20Fx^3+30Gx^4+\ldots$

$y^2=A^2+B^2x^2+C^2x^4+2ABx+2ACx^2+2ADx^3+2AEx^4+2BCx^3+2BDx^4+\ldots$

$\therefore y^2(d^2y/dx^2)+a(dy/dy)^2=bx$ gives us

$$
\begin{array}{r|r|r|r|r|l}
bx=2A^2C & +6A^2D & x+12A^2E & x^2+20A^2F & x^3+30A^2G & x^4+\ldots \\
+aB^2 & +4ABC & +\ 2B^2C & +\ 6B^2D & +12B^2E & \\
 & +4aBC & +12ABD & +24ABE & +\ 2C^3 & \\
 & & +\ 4AC^2 & +16ACD & +40ABF & \\
 & & +\ 4aC^2 & +\ 4BC^2 & +28ACE & \\
 & & +\ 6aBD & +\ 8aBE & +12AD^2 & \\
 & & & +12aCD & +16BCD & \\
 & & & & +\ 9aD^2 & \\
 & & & & +10aBF & \\
 & & & & +16aCE &
\end{array}
$$

Equating like powers of x we get

$$C=-\frac{aB^2}{2A^2},\quad D=\frac{2A^2b+4aAB^3+4a^2B^3}{12A^4},$$

$$E=\frac{aB^4[A^2-(A+a)\ (4A+3a)]-abA^2B-2bA^3B}{12A^6}.$$

$$\therefore y=A+Bx-\frac{aB^2}{2A^2}x^2+\frac{2A^2b+4AB^3+4a^2B^3}{12A^4}x^3$$

$$+\frac{aB^4[A^2-(A+a)(4A+3a)-abA^2B-2bA^3B}{12A^6}x^4+\ldots$$

where A and B are constants of integration.

This solution does not give a unique result.